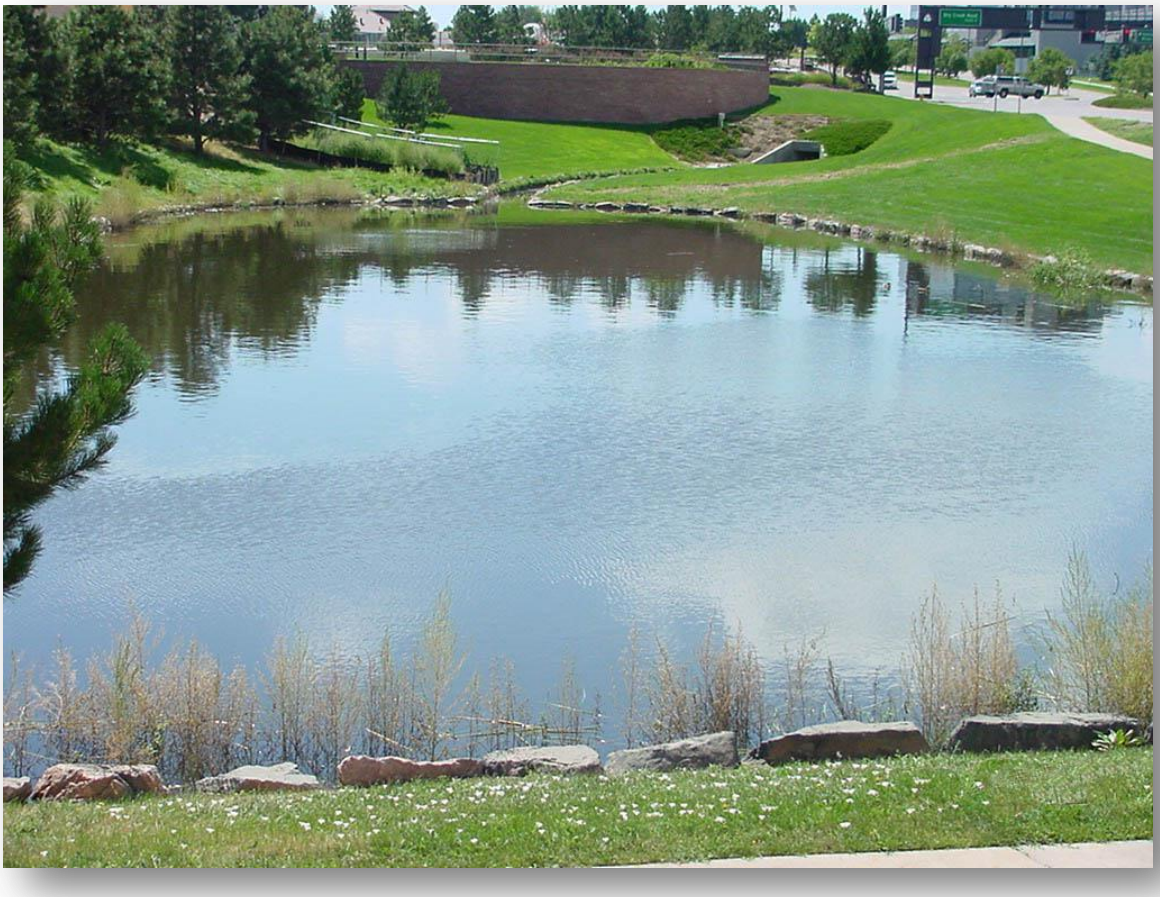
Water Conservation Plan

Inverness Water and Sanitation District

March 2011



INVERNESS
WATER AND SANITATION DISTRICT

Adopted: March 2, 2011

Acknowledgements:

Prepared by Nolte Associates, Inc.

In association with Douglas County, CO

With Support from The Colorado Water Conservation Board

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List of Abbreviations

acre-foot (AF)	Unit of volume to measure water, equivalent to an acre of area covered with one foot of water (325,850 gallons)
AFY	Acre-feet per year
AMR	Automated meter reading
AWWA	American Water Works Association
BMP	Best Management Practice
BP	Best Practice
CII	Commercial, Industrial, Institutional
CWCB	Colorado Water Conservation Board
GPM	Gallons per minute
GPCD	Gallons per capita per day
Gross Per Capita Water	Total treated water production divided by total service
HOA	Home Owner's Association
MG	Million gallons
MGD	Million gallons per day
SMWSA	South Metro Water Supply Authority
SWSI	Statewide Water Supply Initiative
TE	Tap equivalent
ULFT	Ultra Low Flow Toilet
WTP	Water Treatment Plant
WCP	Water Conservation Plan
WSD	Water and Sanitation District

Section 1: Introduction

The **Inverness Water and Sanitation District (IWSD)** was established in 1973 to provide water supply and wastewater service to the Inverness Business Park. IWSD proudly serves high-quality water to an upscale commercial and growing residential suburb located southeast of metro Denver. In Colorado, water is life. Respect for our limited, natural resource runs hand in hand with providing all consumers an efficient, sustainable water supply at the best price possible. That's why the District strongly believes in proactive water conservation and has been practicing reuse for more than thirty years.

1.1 Purpose

IWSD developed this water conservation plan (WCP, the Plan) as part of the Douglas County Regional Water Conservation Planning Program (RWCPP). This program provides assistance for preparing WCPs for as many as 20 water providers, then compiling those plans into a regional WCP for Colorado Water Conservation Board (CWCB) approval.

The IWSD Plan is consistent with the State's emphasis on regional planning in the Statewide Water Supply Initiative (SWSI) efforts, coupled with new developments in the field of water conservation. The Douglas County region is heavily dependent on nonrenewable Denver Basin groundwater; water conservation is an essential element in helping the region achieve long-term sustainability. To that end, this Plan has been funded by a grant from the CWCB and contribution by the Douglas County Board of Commissioners.

The purposes of the Plan are to:

- Characterize water use and demand forecasts
- Identify, evaluate, and select conservation measures and programs

Throughout its history, IWSD has delivered reliable potable water to its commercial, residential, and irrigation water users. IWSD is committed to sustainable and efficient use of its water resources and will be implementing this WCP as a key element of an integrated water resources planning approach. That planning also includes full reuse capability and development of new supplies in partnership with the South Metro Water Supply Authority (SMWSA). The Plan is also warranted as water conservation technology has improved to the point that water use efficiency can be planned and implemented more reliably and predictably than at any time in the past.

This Plan identifies recommended water conservation measures and programs that will promote, support and sustain efficient water use by the IWSD customers. The Plan identifies the various stages of water conservation for the next five to ten years, and follows the scope of work agreed upon by the Colorado Water Conservation Board (CWCB) and Douglas County in establishing the Douglas County RWCPP.

1.2 Organization

In keeping with that scope of work, this Plan is organized as follows:

1. Introduction
2. Existing system, water sources, and limitations
3. Current water use
4. Pricing structures and existing Conservation Efforts
5. Identification and screening of proposed conservation measures
6. Demand forecasts with different conservation programs

7. Impacts of conservation programs
8. Implementation and Monitoring Plan

Section 2: Existing System, Water Sources, and Limitations

IWSD is a quasi-municipal corporation and a political subdivision of the State of Colorado. IWSD was created pursuant to Article 1 of Title 32 C.R.S. for the purpose of providing complete water supply and sanitary sewer systems for the IWSD customers.

2.1 Geography and Demographics

Approximately 2/3 of the District is located in the City of Centennial in Arapahoe County (north of County Line Road), and 1/3 in unincorporated north central Douglas County. The District's 900-acre service area is shown in Figure 2-1.

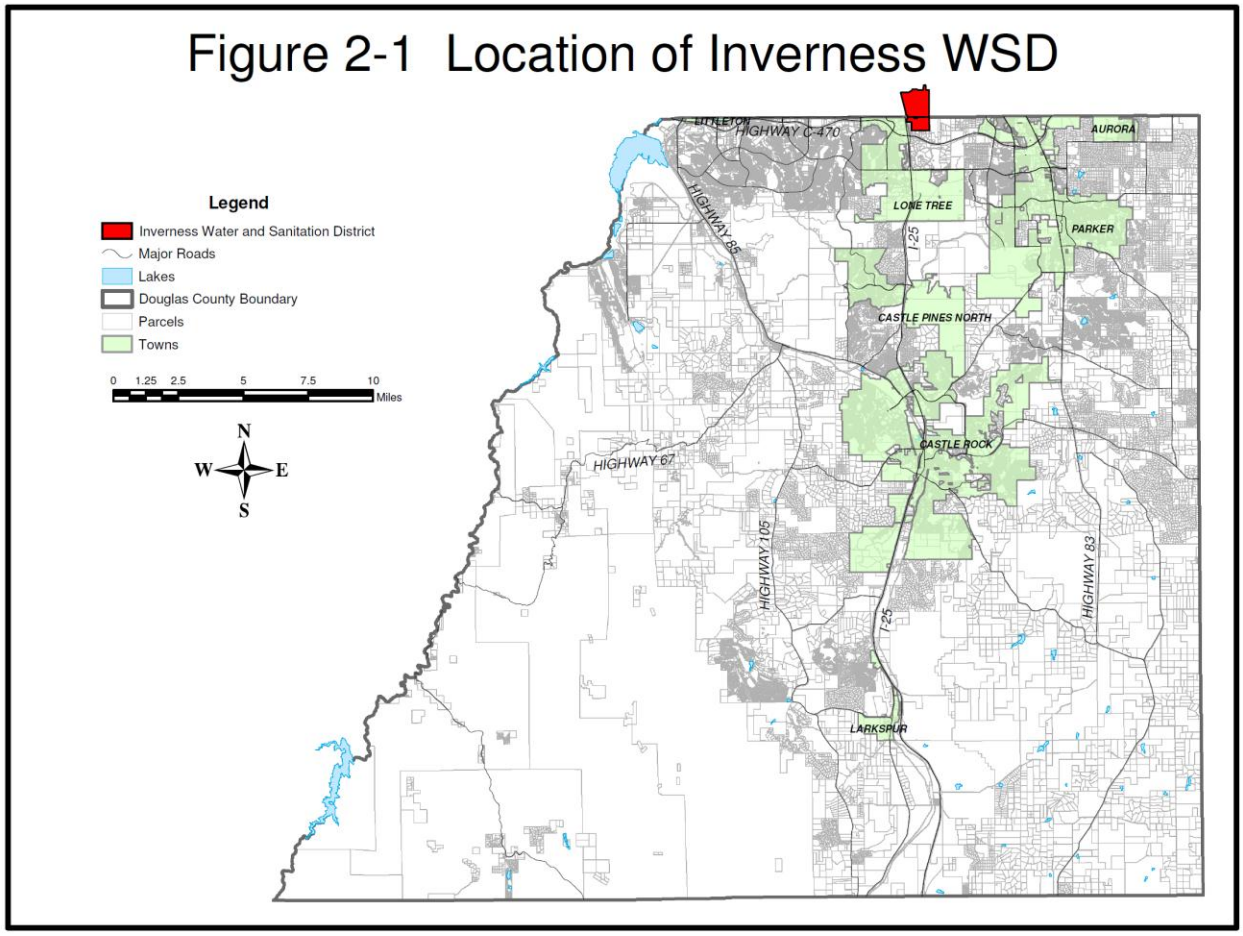

Figure 2-1
Location of IWSD

2.2 Historical Water System Development

IWSD is located in an area of limited and unreliable surface water supplies. Cherry Creek, located to east of the District, is the largest stream in the area. At the time of District formation, it was more cost-effective for IWSD to develop Denver Basin groundwater than to develop significant water rights and infrastructure necessary to divert, store, convey and treat surface water supplies. Local streams in the vicinity of IWSD have intermittent flow and are unreliable for meeting their primary water supply needs. Groundwater

supplies in the Denver basin formation were readily available, drought resistant, could be developed incrementally at a relatively low cost, and needed minimal treatment.

IWSD is essentially a business park surrounding a golf course, and consists primarily of commercial customers. The District serves 123 office buildings, a golf course, three hotels, three multi-family complexes, an athletic club, a bank, a mixed use building (retail/residential), and 13 irrigation services. The District did not have its first residential development until Vellagio started in 2008. In 2010, the District serves only 23 homes for which Douglas County estimates the population at 53. More residential growth is expected in the years ahead as this one large residential development matures.

2.2.1 Nontributary Groundwater

IWSD's existing nontributary groundwater supplies are derived from wells drilled in the Denver Basin. The Denver Basin formations underlying the service area include the Dawson, Denver, Arapahoe and Laramie-Fox Hills formations. Figure 2-2 is an illustrative cross-section of the Denver Basin aquifer formations.

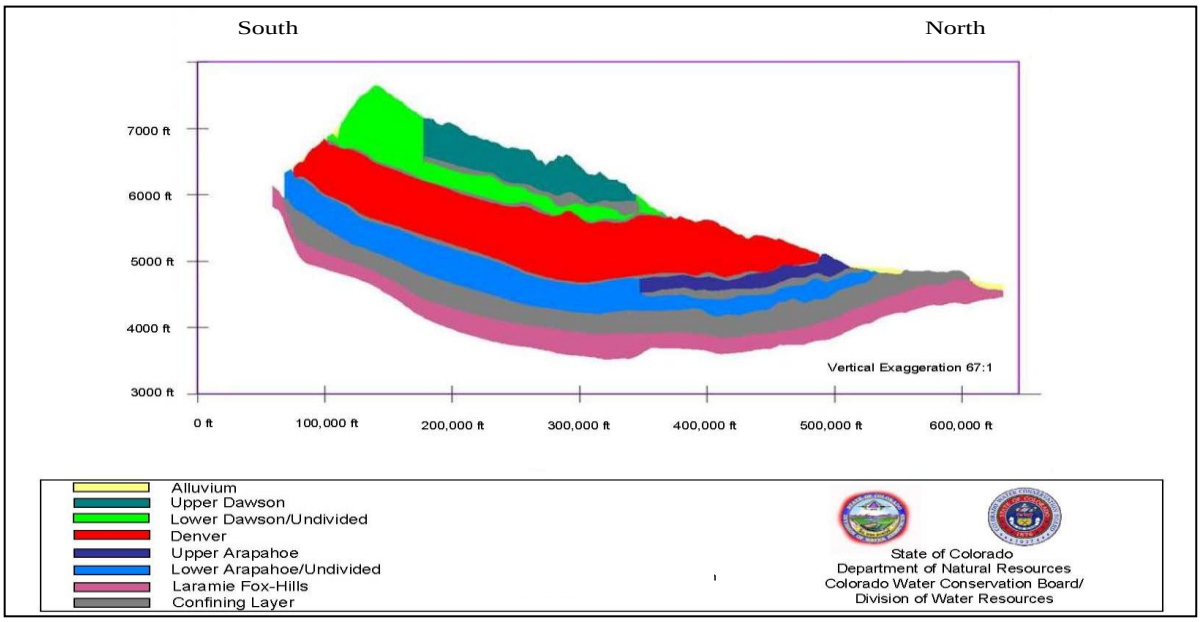

Figure 2-2
Denver Basin Aquifer South-North Cross Section
South Platte Basin
(Source: CWCB South Platte DSS)

The initial groundwater development to meet IWSD's water demands occurred within the district boundaries. Wells were drilled incrementally as development occurred. The non-tributary groundwater supplies developed by IWSD require minimal treatment. Treatment to meet regulatory requirements for disinfection is done at individual well sites. Table 2-1 provides information on the number, location and aquifer source of IWSD's existing nontributary groundwater wells.

2.2.2 Nonpotable Irrigation System

Nonpotable water is used for all outdoor irrigation in IWSD. In fact, the District functions as a "closed system" with no wastewater discharge. All of IWSD's wastewater flows to the Lone Tree Creek Reuse Facility operated by neighboring Arapahoe County Water and Wastewater Authority (ACWWA). IWSD owns a share of that facility's capacity, expanded to 3.6 mgd in 2009.

Following treatment, IWSD's reuse water is returned to the District and stored in a central storage reservoir with a capacity of 440 AF. The water is then lightly chlorinated and distributed throughout the District via a dedicated system for irrigation use.

2.2.3 Denver Water

IWSD is a Denver Water connector. By contract, IWSD can take delivery of nearly 600 AFY of potable water from Denver via a master meter connection.

2.2.4 Reuse of Wastewater Return Flows

As discussed in Section 2.3.2, the District fully reuses its wastewater and has no return flow to a surface stream.

2.3 Water Sources and Yields

A summary of the existing annual yield of the major water sources for IWSD are summarized in Table 2-1.

Water Supply Source	Aquifer	Annual Yield (AFY)	Water Rights (AFY)	Comments
In-District Groundwater: Well C	Dawson	0	824	Well constructed in 1980
In-District Groundwater: Wells 1 through 4	Arapahoe	795	1305	Wells constructed in 1980, 1989, 2006, and 2009
Outside District Sources	None	180	593	Denver Water Supply Contract
Nonpotable Irrigation	---	485	---	Reuse water conveyed from ACWWA Lone Tree Creek Reuse Facility
Recapture of Reusable Return Flows	---	---	---	Accounted for with nonpotable irrigation
Storage Rights	---	440	440	Inverness Reservoir used for effluent return for irrigation
Total		3162	2129	

Table 2-1
Summary of Major Water Sources
Inverness Water and Sanitation District

2.4 Ability to Serve

IWSD currently relies on wells from the Denver Basin aquifers for approximately 70 percent of its water supply. Groundwater is pumped from five wells. If all of the nontributary wells owned or under the control of IWSD were drilled, connected to the system, and could produce the decreed amount, the aggregate yield would be approximately 2129 AFY.

IWSD has conducted internal planning studies for the raw and treated water systems that describe the planning of water supply acquisitions. Based on that analysis, IWSD is seeking to acquire an additional 500 AFY of renewable water supply and delivery capacity by 2020 through its membership in the SMWSA. A

summary of system conditions is shown in Table 2-2. The District is actively working to reduce its reliance on the nonrenewable groundwater used by many throughout the region, identified in SWSI as a critical water supply area.

Planning Questions	Yes	No	Comments
Does the system frequently experience shortage of supply emergencies?		X	
Does the system have substantial unaccounted-for and lost water?		X	The average age of the water supply infrastructure is 17 years.
Is the system experiencing a high rate of population and/or growth?		X	
Is the system planning substantial improvements or additions?	X		IWSD has estimated that Capital Improvement Projects amounting approximately to $15M for the next 10 years are needed to meet the District's build out water supply by using more renewable water supplies rather than continuing relying on its nontributary water source.
Are increases to wastewater system capacity anticipated within the planning horizon?		X	As of July 2009, Inverness Water and Sanitation District no longer treats wastewater flows on site. Wastewater flows are sent to the Arapahoe County Water and Wastewater Authority's Lone Tree Creek Plant for treatment.

Table 2-2
Summary of System Conditions
Inverness Water and Sanitation District

2.5 System Limitations

The District has no substantial limitations, but is very focused on improving the sustainability of its water supplies.

Section 3: Current Water Use

3.1 Annual Water Use by Customer Class

The IWSD customer base, as shown in Table 3-1 and Figure 3-1, consisted entirely of commercial and irrigation-only accounts in 2008. The baseline of 2008 was selected because it was fairly recent, has complete data readily available, and was a relatively average year with regard to precipitation. As previously stated, some residential development has occurred since 2008. To reflect the addition of that new customer class, Table 3-1 has been modified to include residential development from 2008 to 2010. It is important to note that 2008 water usage was impacted by the post-2002 drought reductions in demand experienced throughout the Front Range. The long-term effects of the "drought shadow" are unknown. When considered on the basis of water production as shown in Figure 3-1, unaccounted-for water is estimated at 17.6 percent.

General Class	2008 Total (in MG)	% of Total	Number of Taps							Total Taps	Total TEs	Unit Demand (gpd/TE)	GPCD
			3/4"	1"	1.5"	2"	3"	4"	6"				
Single Family Residential	2.1	0.5%	23	---	---	---	---	---	---	23	23	247	85
Multi-Family Residential [1]	5.0	1.3%	73	---	---	---	---	---	---	73	73	187	85
Residential Subtotal [2]	**7.1**	**1.8%**	**96**	**---**	**---**	**---**	**---**	**---**	**---**	**96**	**96**	**201**	**91**
Commercial, Industrial, Institutional	192.1	48.2%	12	25	14	73	15	---	---	139	972	541	---
Golf Course	51.3	12.9%	---	---	---	---	---	1	1	2	94	1,494	---
Irrigation (Nonpotable)	148.0	37.2%	1	---	1	23	2	---	1	28	289	1,403	---
Nonresidential Subtotal	**391.3**	**98.2%**	**13**	**25**	**15**	**96**	**17**	**1**	**2**	**169**	**1,355**	**791**	**---**
Total	**398.4**	**100%**	**109**	**25**	**15**	**96**	**17**	**1**	**2**	**265**	**1,451**	**752**	---

1. TEs shown are for 96 multi-family units estimated at 2.2 people per unit.
2. Residential development in 2010 has been added to the 2008 customer base.

Table 3-1
Annual Water Use in 2010
by Customer Class

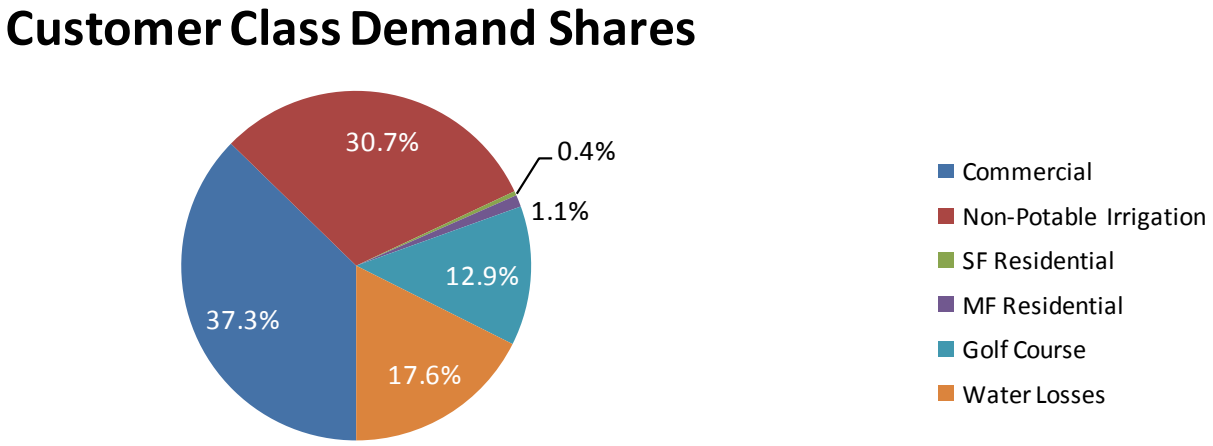

Figure 3-1
Percent of Annual Water Use in 2010 by Customer Class

3.2 Historical Water Demand

Total annual water production for 2000 through 2009 is shown in Figure 3-2. Nonpotable water usage is included in the total water production shown in this figure. As seen in Figure 3-2, demand actually decreased by more than 10 percent from 2000 to 2008, dropping from over 355 MG to 318 MG; a reduction of 37 MG. The decrease in water usage following the 2002 drought is readily apparent. In 2009, demand fell to approximately 246 MG. A similar drop in water usage was seen regionally that year, likely due to above average precipitation during the irrigation season.

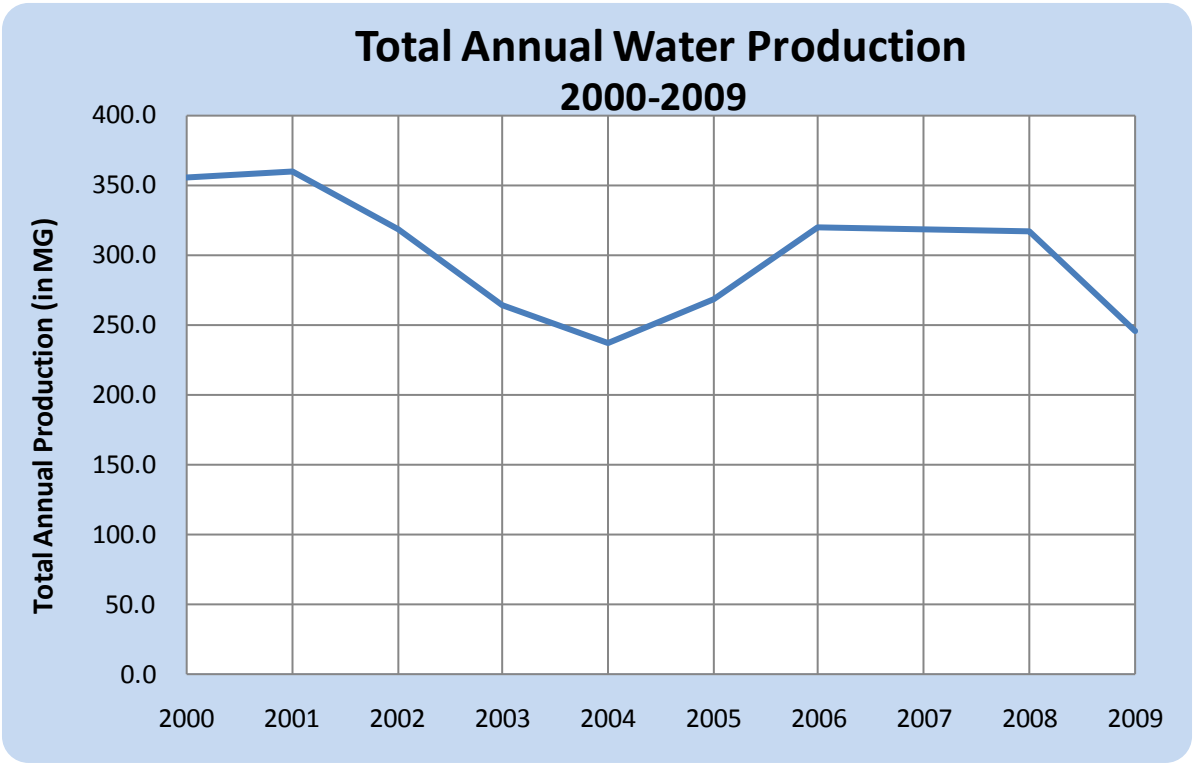

Figure 3-2
Total Annual Water Production

IWSD tracks the number of water customers as tap equivalents (TEs). One TE is the estimated water use for a ¾-inch water tap. Other water users that have larger water taps are converted to TEs as shown in Table 3-2.

Tap Size (inches)	Tap Equivalents
3/4	1
1	2
1.5	4
2	8
3	18
4	30
6	64*

*Determined by Board of Directors

Table 3-2
Tap Equivalents by Tap Size

3.2.1 Unit Water Demands

An analysis of per capita water demand is a common measurement of water use. Average daily water demand divided by the number of TEs served provides the unit demand in gallons per day per TE (gpd/TE). Unit water demands by customer class have been calculated for 2008 and are shown in Table 3-1. Residential demand was assumed to be 85 GPCD for indoor use, given that irrigation demands are metered separately.

The estimated total unit demand for IWSD based on 2008 was 752 gpd/TE, and the nonresidential unit demand was 791 gpd/TE. Nonresidential demands can vary significantly, depending on the specific customer characteristics in each area. However, the IWSD unit demands are comparable to billed nonresidential demands for Centennial WSD (Douglas County's largest water provider) in 2007 which averaged approximately 830 gpd/TE. (Water Conservation Plan – CWSD, 2007, pg 22).

3.2.2 Peak Water Demands

Monthly water production for the 2008 baseline year is shown in Figure 3-3. In the case of IWSD, water production encompasses varied supply sources; well production, reuse pumping for irrigation, and contract water from Denver Water. The peak month production/demand for 2008 occurred in July. That month's production of 54.9 MG was 107 percent higher than the average annual production of 26.5 MG per month for a peak month to average month ratio of 2.1 to 1.

Because nearly all of IWSD's irrigation demands are met with reuse water metered separately from in-building use, indoor and outdoor uses can be separately analyzed. Based on total metered commercial demand of 192.1 MG in 2008, the average monthly indoor use is 16.0 MG. The total metered irrigation demand of 148.0 MG (not including the golf course) averages 24.7 MG over the six-month irrigation season. Therefore, average winter demand was 16.0 MG per month, and average summer demand was 40.7 MG per month in 2008; 2.5 times the average indoor demand.

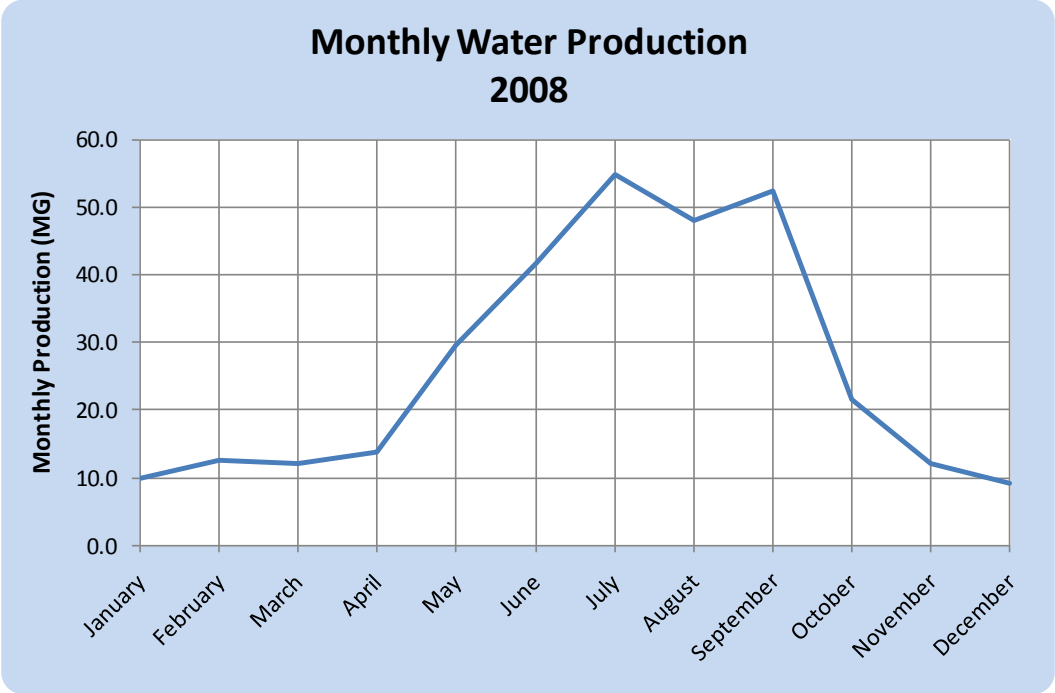

Figure 3-3
Monthly Water Production 2008

3.3 Water Loss Accounting

The description of current water use in this Plan is meant to be consistent with the International Water Association (IWA) and American Water Works Association (AWWA) Water Balance approach, which was published in 2000 as part of the IWA publication Performance Indicators for Water Supply Services to provide utilities a consistent methodology for assessing water loss. Though the full assessment of a water balance is outside the realm of this report, the terminology is consistent. The main categories discussed for IWSD are revenue (metered) and non-revenue (metered and unmetered) water, which are defined in Figure 3-4 on the next page.

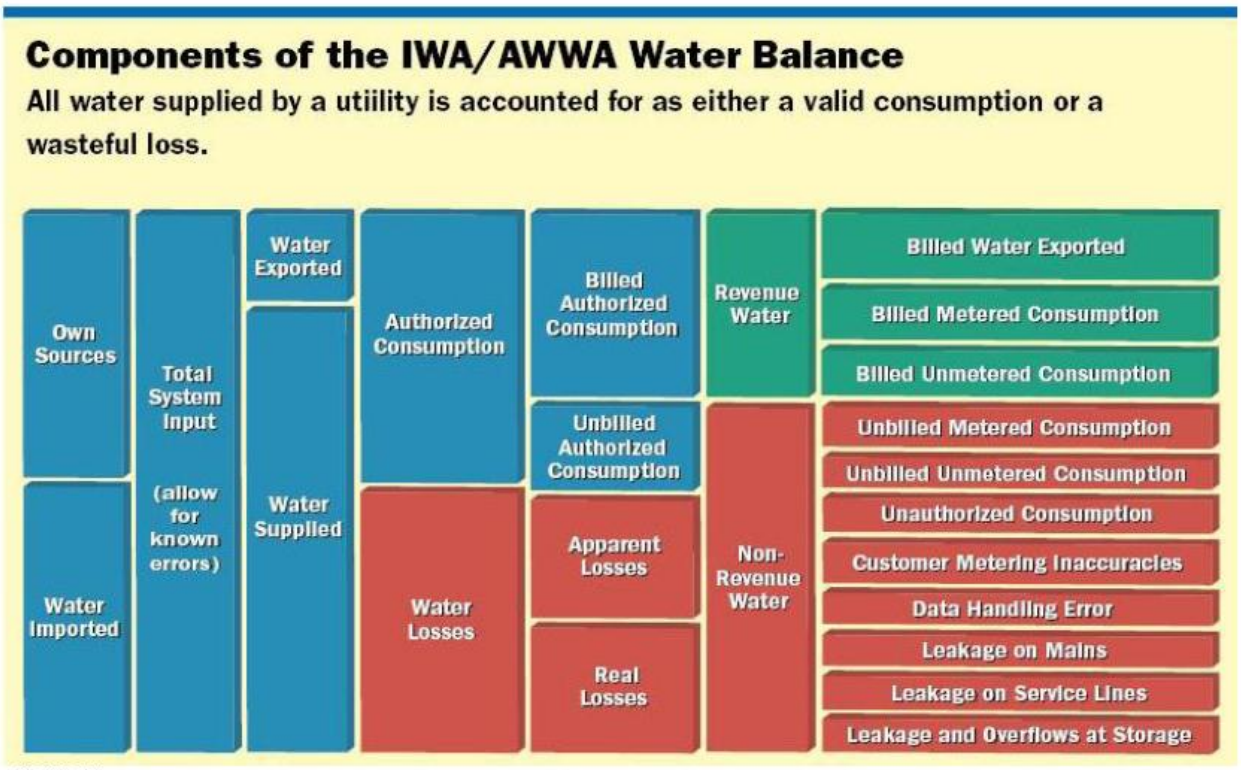

Figure 3-4
IWA/AWWA Water Balance Summary
(Source: AWWA Publication, Opflow, October 2007)

All of IWSD's water use is metered and billed. There are no customers that receive water that is unbilled, and all metered water use is Revenue Water as defined in the IWA/AWWA Water Balance. The non-revenue water use for the IWSD system includes:

- Unbilled, unmetered consumption (see below)
- Customer metering inaccuracies
- Data handling errors
- Leakage on mains
- Leakage on service lines
- Leakage and overflows at storage

Unbilled, unmetered consumption includes the following:

- IWSD's annual waterline and fire hydrant flushing program
- Street sweeping or construction operations using fire hydrants to fill vehicles. They are required to have a hydrant meter, but occasionally will not use the hydrant meter, in violation of IWSD requirements.
- Fire department operations filling fire trucks for firefighting and training activities.

A comparison of estimated total water production vs. total water billed in 2008 is shown in Figure 3-1. Although AWWA now recommends evaluating non-revenue (or unaccounted-for) water without reference to percentage of water produced, such a reference has been a standard practice in the industry for many years

("Water Wiser," 2010) (Angers, 2001). At the level of analysis in this water conservation plan, it is helpful to consider the District's water system with respect to the accepted benchmark of up to 15 percent unaccounted-for water. As shown in Figure 3-1, IWSD's unaccounted-for water of 17.6 percent exceeds the industry standard and should be evaluated more closely.

Section 4: Pricing Structure and Existing Conservation Efforts

IWSD has used water conservation measures to manage water demands and conserve water since it was formed, but the District has stepped up its conservation efforts significantly in recent years. The IWSD water conservation program offers a diverse range of programs and measures targeted at all water demand customer classes. Demand management strategies have included conservation measures designed to manage peak day demands and also measures designed to reduce total annual demands.

IWSD has implemented a conservation-oriented water rate structure designed to encourage efficient use for all customers. Other measures include turf replacement, water audits, and irrigation metering. The current program is described in this section and summarized in Table 4-2.

4.1 Pricing Structure

Modifications to increasing block rate structure – IWSD implemented a tiered, increasing-block rate structure with water budgets in 2003 in order to promote water conservation through pricing.

	Within Annual Allocation (per 1,000 gal)	In Excess of Annual Allocation (per 1,000 gal)	In Excess of 150% of Annual Allocation (per 1,000 gal)
Service Fee	$2.75	$5.50	$8.25

Table 4-1
Water Rates

Monthly billing – To increase customer awareness of water use, IWSD went to monthly billing for all customers in 2003.

4.2 Operational Utility Side Measures

Integrated Resources Planning – IWSD has practiced integrated resources planning (IRP) as part of its overall water supply and demand management strategy. A least-cost analysis of demand and supply options resulted in the conclusion that water conservation and demand management options were cost-effective and, as a result, incorporated into future supply planning. As implemented by IWSD, the integrated resources planning approach is a comprehensive planning effort that incorporates water conservation as a key component for meeting future needs.

Full metering – All IWSD customers and associated water use is metered and billed.

Conservation Coordinator – Mr. Mitch Chambers of Mulhern MRE (the firm that professionally manages IWSD) serves as the District's water conservation coordinator, and he can draw on support from the Douglas County Water Resource Authority (DCWRA) as needed.

4.3 Water Loss Control Program

Water Loss Control Program – Total well production, Denver treated water deliveries, and reuse water together represent total water production. Total water production is compared to total water billed to determine water losses. IWSD will need to evaluate their losses more closely, but if they truly do exceed 15 percent or are trending upward, the District will implement a leak detection program.

4.4 Education and Public Information

Conservation Public Information Campaign – Water conservation information is disseminated via bill inserts, brochures and website. Water conservation topics include information on the turf removal and low-flow fixture rebate programs, irrigation management, xeriscaping and other water saving tips. Staff responds to residential and commercial customers with water use or billing questions and requests for water conservation information.

School Education Programs – IWSD is a member of the DCWRA, and the education resources of DCWRA are available to customers. A DVD on Xeriscape prepared by DCWRA was distributed to every customer. A proactive education program to visit schools with water conservation programs is also underway.

4.5 Indoor Efficiency

Water budgets for in-building accounts – Water budgets for in-building use were first implemented in 2003. Water budgets were set at 80 percent of the historic District average consumption per 1,000 sf for occupied floor area for each customer, divided by 12 to set as a monthly allotment.

Low-Flow Fixtures – Rebates of 50 percent of the fixture cost are offered for low-flow plumbing fixtures. The program has been in effect since 2003. Each customer can receive a total rebate of up to $10,000 in any one year, including the turf replacement rebate.

High-use Customers – Through monitoring performance with respect to water budgets, IWSD identifies those customers that use more water than allocated. As a means of helping those customers better control their water use, IWSD will install additional meters and split the cost of installation with the customers. For example, the District recently installed meters for cooling towers at a large data center.

4.6 Outdoor Efficiency - Landscapes and Irrigation

Water budgets for irrigation accounts – Water budgets for irrigation accounts were first implemented in 2003. Aerial photography and GIS were used to calculate the irrigated areas for each irrigation account. Annual water budgets are based on 24 inches of irrigation per year. Monthly allotments are based on the District's historical averages through the irrigation season, April through October.

Turf Replacement – Rebates of $1 per sf are offered for replacing turf with low water use landscape (such as native grasses and ornamental trees) approved by the Inverness Planning and Architectural Control Committee. The program has been in effect since 2003. Each customer can receive a total rebate of up to $10,000 in any one year, including the low-flow fixtures rebate.

In addition, the District is systematically replacing turf with native grasses and ornamental trees in common areas throughout the business park as budget allows. Baseball fields in the District have turf for the playing areas, but the surrounding areas are covered in native grasses.

Irrigation System Water Conservation Requirements– Irrigation design and water use requirements have been established as a performance standard. All irrigation system designs must be submitted for review and approval prior to the issuance of an irrigation tap. Irrigation systems are inspected after installation.

Irrigation Meters – Through monitoring performance with respect to water budgets, IWSD identifies those customers that use more water than allocated. As a means of helping those customers reduce their billings, IWSD will install irrigation meters and split the cost of that installation with the customers.

Efficient Irrigation Systems – IWSD is using subsurface irrigation methods to reduce evaporation losses and increase overall irrigation efficiency as they remove turf from common areas. They are also replacing irrigation nozzles with more efficient types.

4.7 Water Reuse Systems

Nonpotable irrigation system – As part of IWSD's overall water management and conservation program, the District implemented reuse of legally reusable flows. This is accomplished via a nonpotable irrigation system. The nonpotable irrigation system includes pumping of treated reuse water from a central storage reservoir to serve almost all irrigation needs throughout the District. The system currently supplies approximately 440 AFY of water.

4.8 Current Water Conservation Program

Water Conservation Measure
Pricing Structure
Modification to Increasing Block Rate Structure
Monthly Billing
Operational Utility Side Measures
Integrated Resources Planning
Full Metering
Conservation Coordinator
Water Loss Control Program
Tracking of Water Losses
Education and Public Information
Conservation Public Information Campaign
School Education Programs (via DCWRA)
Indoor Efficiency
Water Budgets for In-Building Accounts
Low Flow Fixtures
High Use Customers
Outdoor Efficiency – Landscapes and Irrigation
Water Budgets For Irrigation Accounts
Turf Replacement
Irrigation System Water Conservation Requirements
Irrigation Meters
Efficient Irrigation Systems
Water Reuse Systems
Nonpotable Irrigation System

Table 4-2
Current Water Conservation Program

Section 5: Identification and Screening of Proposed Conservation Measures

IWSD has implemented a comprehensive water conservation program described in Section 4. Significant water use savings have been realized. As part of this water conservation plan, the existing water conservation measures and additional water conservation programs and measures were evaluated. It is important to note that as a water district, IWSD does not have land use or building permit regulatory authority. As a result, IWSD does not have the regulatory authority to require certain water conservation measures.

In July, 2008, the CWCB awarded an efficiency grant to Colorado Water Wise, a water conservation non-profit group, to create a best management practices guidebook specific to Colorado. The guidebook will assist water providers with the selection and implementation of effective water conservation programs and measures. The Colorado WaterWise Guidebook of Best Practices for Municipal Water Conservation in Colorado is a planning tool prepared for the purpose of improving and enhancing water efficiency in Colorado. The Best Practices Guidebook for Municipal Water Conservation in Colorado (Best Practices Guidebook) offers a detailed description of specific water conservation measures, program elements, regulations, policies, and procedures that can be implemented by Colorado water providers to help ensure reliable and sustainable water supplies for future generations.

The existing IWSD water conservation measures were evaluated and compared to the Best Practices Guidebook to determine if there were potential best practices to be considered that are not part of the current IWSD water conservation program. The Best Practices are shown in Table 5-1. The Best Practices Guidebook was also used to evaluate potential additional conservation measures.

Measure	Best Practice	Category or Sector Impacted
Full metering	BP 1	ALL
Conservation oriented rates	BP 1	ALL
Conservation oriented tap fees	BP 1	ALL
Integrated resource planning, goal setting and monitoring	BP 2	Utility
Water loss control	BP 3	Utility
Conservation coordinator	BP 4	ALL
Water waste ordinance	BP 5	ALL
Public information and education	BP 6	ALL
Landscape water budgets	BP 7	Outdoor irrigation
Rules and regulations for landscape design and installation	BP 8	Outdoor irrigation
Certification of landscape professionals	BP 8	Outdoor irrigation
Water efficient design, installation and maintenance practices for new and existing landscapes	BP 9	Outdoor irrigation
Irrigation efficiency evaluations	BP 10	Outdoor irrigation
Rules for new construction (residential and non-residential)	BP 11	ALL
High efficiency fixtures and appliances-Residential	BP 12	Residential
High efficiency fixtures and appliances-Non Residential	BP 12	CII
Residential water surveys and evaluations, targeted at high demand customers	BP 13	Residential
Specialized non-residential surveys, audits, and equipment efficiency improvements	BP 14	CII

Table 5-1
Water Conservation Best Practices from Guidebook

Descriptions of the existing and proposed conservation measures that were evaluated are included below. A summary of the water conservation measures are shown in Table 5-2.

5.1 Pricing Structure

Modifications to increasing block rate structure – IWSD will continue to refine its water rate structure to promote water conservation. **(BP #1)**

Monthly Billing – IWSD will continue to bill customers monthly.

Renewable Water Supply Charge – IWSD will continue its program to develop renewable water supplies and reduce dependence on nontributary groundwater. The District will consider financing this with a Renewable Water Supply Charge if warranted. **(BP #1)**

5.2 Operational Utility Side Measures

Integrated Resources Planning – This is an existing measure and will continue to be the foundation of IWSD's water supply and demand management strategy. As described in Section 7, this approach has resulted in significant savings in infrastructure and water rights development and O&M costs. **(BP #2)**

Full Metering – All IWSD customers and associated water use will continue to be metered and billed**. (BP #1)**

Mandatory Watering Days – The District does not currently use mandatory watering days, but it can implement such a program if it becomes necessary.

Conservation Coordinator – The District will continue to assign a water conservation coordinator, and that coordinator can draw on support from DCWRA. **(BP #4)**

Water surveys and evaluations, targeted at high demand customers – IWSD has an existing water budget program and aggressive increasing water block rates that limit water use and discourage high water users. The District contacts high water users and assists them with better management of demands. **(BP #13)**

5.3 Water Loss Control Program

Water Loss Control Program – IWSD averaged 17.6 percent water loss in 2008. If upon closer evaluation, water losses continue to exceed 15 percent, IWSD will implement a leak detection program. **(BP #3)**

5.4 Education and Public Information

Conservation Public Information Campaign – In addition to its existing in-house public education program, IWSD will use the services of Douglas County and DCWRA for dissemination of water conservation information. **(BP #6)**

School Education Programs – IWSD will use the services of the DCWRA for implementation of school education programs. **(BP #6)**

Annual Large Irrigators Water Conservation Meetings – IWSD's water conservation program is very effective and its large irrigators are knowledgeable about water conservation. The District does not currently

see the need for an annual meeting, as the staff can meet with large irrigators on an "as needed" basis. **(BP #6)**

5.5 Indoor – Residential

Low-Flow Fixture Rebates – IWSD will continue its low-flow fixture rebate program. The annual budget allocated for rebates will be evaluated annually. **(BP #12)**

Rules for New Construction – IWSD as a water district does not have the regulatory authority to require high efficiency plumbing fixtures or other conservation measures for new residential construction. IWSD will work through the DCWRA and the Douglas County Board of Commissioners on the development of residential building regulations for areas covered by DCWRA water providers. **(BP #11)**

5.6 Indoor – CII

Rules for new construction - building codes requiring high efficiency fixtures and process equipment – IWSD as a water district does not have the regulatory authority to require high efficiency plumbing fixtures or other conservation measures for new Commercial, Industrial or Institutional construction. IWSD will work through the DCWRA and the Douglas County Board of Commissioners on the development of CII building regulations for areas covered by Douglas County water providers. **(BP #11)**

Specialized non-residential surveys, audits and equipment efficiency improvements – IWSD will continue its billing reviews and support for reducing demands of high-use customers. IWSD will consider greater use of non-residential surveys, audits and equipment efficiency improvements. **(BP #14)**

5.7 Outdoor Efficiency - Landscapes and Irrigation

Water budgets for irrigation accounts – Water budgets for irrigation accounts will continue. **(BP #7)**

Irrigation System Water Conservation Requirements and Certification of Landscape Professionals– Irrigation design and water use requirements will continue as a performance standard. All irrigation system designs must be submitted for review and approval prior to the issuance of an irrigation tap for non-single family residential properties and inspected after installation. The irrigation designer shall be a Certified Irrigation Designer (Commercial) as certified by The Irrigation Association or other professional with extensive experience in the design of commercial irrigation systems as determined by the District Manager. **(BP #8)**

E-T Irrigation Controllers – If irrigation customers request financial assistance for the replacement of E-T irrigation controllers, IWSD will evaluate the request on a case specific basis to determine if there is potential for significant water savings from replacement of controllers. All irrigation controllers must have battery backup or be unaffected by a power interruption and be secured to prevent tampering. Financial assistance from IWSD to irrigators, if approved, will be phased over several years based on actual water use reductions achieved by the irrigators. **(BP #9)**

Efficient Irrigation Systems Program – If irrigation customers request financial assistance for the replacement of existing irrigation systems with highly efficient irrigation systems or installation of new systems, IWSD will evaluate the request on a case specific basis to determine if there is potential for significant water savings. Efficient irrigation systems include subsurface irrigation methods to reduce evaporation losses and increase overall irrigation efficiency. **(BP #9)**

Limits on turf landscaping for new construction – IWSD as a water district does not have the regulatory authority to limit turf landscaping for new construction and does not intend to pursue this with local governments at this time.

Rebates for turf replacement – IWSD will continue its rebate program for the replacement of turf. The annual budget allocated for rebates will be evaluated annually. **(BP #12)**

5.8 Water Reuse Systems

Nonpotable irrigation system – IWSD will continue to fully reuse its treated wastewater for nonpotable irrigation.

Reuse of consumable effluent return flows – IWSD will continue to use all of its consumable wastewater flows.

5.9 Summary of Evaluated Water Conservation Program Activities

Water Conservation Measure	Existing Measure to be Continued	IWSD has Regulatory Authority?	Best Practices Guidebook BP #	Retained for Continued and/or Future Implementation?
Pricing Structure				
Modifications to increasing block rate structure	Yes	Yes	1	Yes
Renewable Water Charge		Yes	1	TBD
Monthly Billing	Yes	Yes	1	Yes
Operational Utility Side Measures				
Integrated Resources Planning	Yes	Yes	2	Yes
Full Metering	Yes	Yes	1	Yes
Mandatory Watering Days		Yes	1	TBD
Conservation Coordinator	Yes	Yes	4	Yes
Residential water surveys and evaluations, targeted at high demand customers	Yes	Yes	13	Yes
Water Loss Control Program				
Water Loss Control Program		Yes	3	TBD
Education and Public Information				
Conservation Public Information Campaign	Yes	Yes	6	Yes
School Education Programs (via DCWRA)		Yes	6	TBD
Annual Large Irrigators Conservation Meetings with HOAs		Yes	6	TBD
Indoor - Residential				
Low Flow Fixture Rebates	Yes	Yes	12	Yes
Rules for New Construction (Building Codes requiring high efficiency fixtures)		No	11	

Water Conservation Measure	Existing Measure to be Continued	IWSD has Regulatory Authority?	Best Practices Guidebook BP #	Retained for Continued and/or Future Implementation?
Indoor - CII				
Rules for new construction - building codes requiring high efficiency fixtures and process equipment		No	12	
Specialized non-residential surveys, audits and equipment efficiency improvements	Yes	Yes	14	Yes
Outdoor Efficiency - Landscapes and Irrigation				
Water budgets for Irrigation Accounts	Yes	Yes	7	Yes
Irrigation System Water Conservation Requirements and Certification of Landscape Professionals		Yes	8	TBD
Water Efficient Maintenance Practices for New and Existing Landscapes		Yes	9	TBD
E-T Irrigation controllers		Yes	9	TBD
Efficient Irrigation Systems Program		Yes	9	TBD
Limits on turf landscaping for new construction		No		
Rebates for turf replacement	Yes	Yes		Yes
Water Reuse Systems				
Nonpotable system augmented by reusable return flow credits	Yes	Yes		Yes
Recapture and reuse of reusable effluent	Yes	Yes		Yes

Table 5-2
Evaluated Water Conservation Program Activities

Section 6: Demand Forecasts

The Alliance for Water Efficiency (AWE) Conservation Tracking Tool was used to project water demands. The Water Conservation Tracking Tool is an Excel-based spreadsheet tool for evaluating the water savings, costs, and benefits of urban water conservation programs. In addition to providing users a standardized methodology for water savings and benefit-cost accounting, the tool includes a library of pre-defined, fully parameterized conservation activities from which users can construct conservation programs. Detailed information on the inputs, assumptions and methods used in Water Conservation Tracking Tool can be found in the User Guide.

Three demand forecasts were made using the Water Conservation Tracking Tool:

1. Baseline
2. Baseline + plumbing code savings
3. Baseline + plumbing code savings + existing and planned water conservation program savings

6.1 Baseline Demand Forecast

The baseline forecast represents the IWSD demand forecast based on projecting the 2008 demands shown in Section 3, including unaccounted-for water. IWSD is projected to reach build-out by 2020 and, without conservation, would then have a water demand of 1,088 AFY. Build-out projections are based on continued development at current levels of density. This demand forecast includes estimated water losses, but does not include the normal raw water supply planning water supply safety factors. For the purposes of this plan, demand forecasts will be treated water forecasts, understanding that firm yield raw water supply requirements are approximately 10 percent greater.

6.2 Baseline + Plumbing Code Savings Forecast

The Baseline + Plumbing Code Savings forecast includes forecasted reductions in demand that have or will occur as a result of National Plumbing Code efficiency standards. For example, ULFT toilet requirements included in the National Energy Policy Act took effect in 1994. New efficiency requirements for clothes washers will take effect in 2011.

The Baseline + Plumbing Code Savings demand forecast is approximately 1,086 AFY in 2020, a savings of only 1 AFY. The plumbing code savings applies only to residential development. Because the District's residential development is all new, there is already a savings associated with new water efficient fixtures and appliances.

6.3 Baseline + Plumbing Code Savings + Program Savings Forecast

The Baseline + Plumbing Code Savings + Program Savings forecast includes forecasted reductions in demand from the existing and planned water conservation program.

The following existing and planned water conservation programs were included as inputs into the AWE Water Tracking Tool to estimate and forecast the water savings from the existing and planned programs. Water savings have been estimated for the major existing programs listed in Table 6.1. These programs are forecast to save 51 AFY by 2020 for a total savings of 52 AFY. This represents a 4.7 percent total savings over the baseline water demands as shown in Table 6.2.

It is estimated that the District's current conservation measures have already saved 148 AFY in demand based on 2010 development. Adding the savings to date to the projected savings through 2020, the 2020 demand is expected to be 199 AFY less than it would have been with no plumbing code or conservation savings; a total savings of 18.3 percent.

Customer Class	Water Conservation Activity Name
SF Residential	Residential LF Toilets
SF Residential	Residential LF Washer
SF Residential	Increasing Tiered Rates
MF Residential	Residential LF Toilets
MF Residential	Residential LF Washer
MF Residential	Increasing Tiered Rates
Non-Potable Irrigation	Installing Separate Meters for High End Users
Non-Potable Irrigation	Large Landscape Turf Replacement
Non-Potable Irrigation	Install Efficient Irrigation Nozzle
Non-Potable Irrigation	Increasing Tiered Rates
Commercial	LEED Certified Development
Commercial	Increasing Tiered Rates

Table 6-1
Water Conservation Activities included in AWE Tool

Service Area Water Savings	Units	Average Annual Savings in 2020
SF Residential LF Toilets	AF	0.2
SF Residential LF Washer	AF	0.1
MF Residential LF Toilets	AF	0.4
MF Residential LF Washer	AF	0.4
Overall Plumbing Code Water Savings*	AF	1.1
Increasing Tiered Rates, SF Residential	AF	1.0
Increasing Tiered Rates, MF Residential	AF	1.0
Installing Meters for High End Users, Non-Potable Irrigation	AF	1.0
Large Landscape Turf Replacement, Non-Potable Irrigation	AF	10.1
Install Efficient Irrigation Nozzles, Non Potable Irrigation	AF	0.3
Increasing Tiered Rates, Non-Potable Irrigation	AF	0.6
LEED Certified Development, Commercial	AF	34.6
Increasing Tiered Rates, Commercial	AF	1.9
Overall Program Water Savings [2]	AF	50.5
Total Water Savings	**AF**	**51.6**
% of Baseline Demands	**%**	**4.7%**

[1] 1.5 AF of plumbing code savings already experienced with existing development
[2] 191.4 AF of program savings already experienced with existing development

Table 6-2
Projected Water Conservation Savings

Section 7: Impacts of Conservation Programs

IWSD implemented an aggressive water conservation program in 2003 and plans to continue that program for future savings. The program has been very effective, resulting in a reduction of more than 10 percent in water demands from 2000 to 2008. ***In recognition of the accrued conservation benefits, IWSD plans to obtain an additional three percent climate-adjusted reduction in demands by 2020, as compared to the 2008 baseline year.***

The forecast total water savings of 199 AFY represents significant benefits. Figure 7-1 shows the projected annual water production to meet demands based on the baseline, baseline + code savings and baseline + code savings + program savings beyond 2010. Build-out projections shown are based on continued development at current levels of density. The District has indicated that they are planning for build-out at significantly higher levels of density. Should that occur, there could be significantly higher conservation savings. The continued successful implementation of conservation measures can delay the need to add water supply capacity.

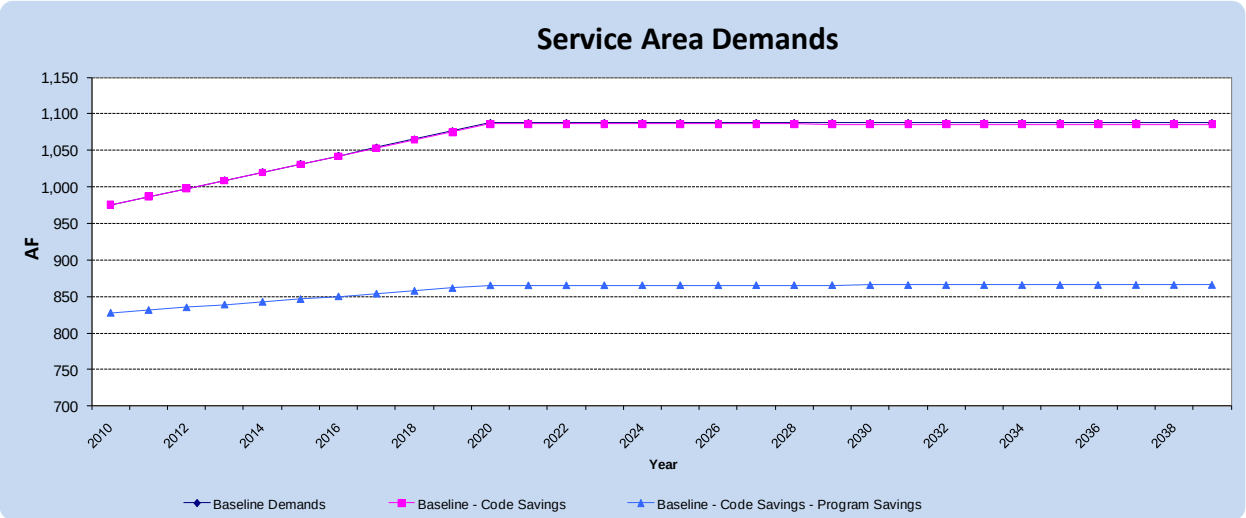

Figure 7-1
Forecast Total Water Demands

7.1 Benefits and Financial Savings

The following benefits and potential financial savings in capital improvements have been identified based on the projected water savings. It will require ongoing conservation efforts to ensure the identified water conservation savings can be made permanent:

Water Supply and Delivery – As IWSD saves on its water demands, the cost savings can be categorized as savings in operation and maintenance (O&M) or capital costs. Marginal savings in water demands will save on O&M of existing equipment and facilities; typically considered the volume charge component. This would include such costs as electrical demands for well pumping or chemical costs for chlorination.
More substantial demand savings over time will save not only on O&M, but could defer the need for some capital improvements. Depending on the increment of conservation savings, IWSD may not need to drill as

many wells or may not need to acquire as much renewable water in the years ahead. The costs of more wells vs. renewable water development will bracket the potential cost savings associated with conservation.

The high-end capital savings is based on IWSD's plans to acquire 500 AFY in renewable water supplies to meet a portion of build-out water demand. As a member of SMWSA, it appears likely that IWSD will benefit from an interruptible supply contract with Denver and Aurora to obtain that water. The regional infrastructure to deliver that water is estimated at $460 M (Baysinger, et al. 2010), and SMWSA members expect that system to deliver 40,670 AFY throughout the region at buildout (Strother, 2010). Approximating the cost on a unit basis, the infrastructure will then cost $11,300 per AFY.

In addition, annual costs payable to Denver and Aurora are expected to range from $4.00 to $6.00 per 1,000 gal. We will assume an average cost of $5.00 per 1,000 gal. To this, the operating, maintenance, and replacement cost of the regional system must be added. That annual cost was estimated at $34.6 M to operate the system for 35,000 AFY (Baysinger, et al. 2010) or approximately $3.00 per 1,000 gal. The total then would be approximately $8.00 per 1,000 gal. or $2,600 per AF.

IWSD will likely have an interest in purchasing renewable water via the SMWSA agreement to offset the escalating costs of continued use of Denver Basin groundwater and provide long-term sustainability, regardless of how much water is saved through conservation. For simplicity, we will assume that the long-term costs for Denver Basin water approach those of the regional system water.

Wastewater Charges – As IWSD saves on its indoor water demands, it will also reduce wastewater flows and wastewater treatment costs. The District's wastewater O&M costs are estimated at approximately $1,900 per AF.

Projected Savings - The conservation savings to IWSD for capital expenditures is summarized in Table 7-1. The total savings in avoided capital expenditures for water supply and delivery infrastructure based on potential savings in 2020 of 199 AF compared to the baseline projection without conservation is $2.25 M. In addition, the District could save $660,000 in annual O&M costs in 2010 dollars. Ongoing water conservation programs will be needed to ensure that these savings are permanent.

Description	Water Demand Units	Total Water Conservation Program Forecast Demand Reductions	Estimated Unit Cost	Total Savings if Demand Reductions are Permanent ($ M)
Capital - Water Supply, Delivery, and Treatment	AFY	199	$11,300	$2.25
Annual O&M, Water System	AFY	199	$2,600	$0.52
Annual O&M, Wastewater System	AFY	73	$1,900	$0.14
Total Annual O&M	---	---	---	**$0.66**

Table 7-1
Projected Capital Expenditure Savings

Section 8: Implementation and Monitoring Plan

8.1 Implementation

IWSD will continue its current water conservation programs. In addition it will implement the new programs previously described in Section 5 and shown in Table 8-1. This table also indicates the proposed dates of implementation.

8.2 Summary of Future Water Conservation Measures

Water Conservation Measure	Date of Implementation if New Measure
Pricing Structure	
Modifications to increasing block rate structure	Ongoing
Renewable Water Supply Charge	Ongoing
Monthly Billing	Ongoing
Operational Utility Side Measures	
Integrated Resources Planning	Ongoing
Full Metering	Ongoing
Mandatory Watering Days	TBD
Conservation Coordinator	Ongoing
Residential water surveys and evaluations, targeted at high demand customers	Ongoing
Water Loss Control Program	
Water Loss Control Program	TBD
Education and Public Information	
Conservation public information campaign	Ongoing
School education programs (via DCWRA)	TBD
Annual water conservation meetings with HOAs	TBD
Indoor - Residential	
Residential clothes washer rebates	Ongoing
Residential toilet rebates	Ongoing
Residential toilet rebates for WaterSense high efficiency only	Ongoing
Indoor - CII	
Specialized nonresidential surveys, audits and equipment efficiency improvements	Ongoing
CII high efficiency toilet and urinal rebates	Ongoing
Outdoor Efficiency - Landscapes and Irrigation	
Water budgets for residential and irrigation accounts	Ongoing
Irrigation System Water Conservation Requirements and Certification of Landscape Professionals	TBD
Water Efficient Maintenance Practices for New and Existing Landscapes	TBD
Efficient Irrigation Systems Program	TBD
E-T Irrigation controllers	TBD
Rebates for turf replacement	Ongoing
Water Reuse Systems	
Nonpotable system augmented by reusable return flow credits	Ongoing
Recapture and reuse of reusable effluent	Ongoing

Table 8-1
Future Water Conservation Measures

8.3 Ongoing Monitoring

IWSD will track the impacts of the conservation plan annually. Monitoring of total and billed water usage will provide information on water use and progress toward the water conservation goals. With County and State support, IWSD could produce a progress report on the conservation program in 2015 that includes a detailed description of plan implementation as well as the measured impacts on usage.

8.4 Plan Refinement

IWSD will periodically evaluate its program and implementation for conformance with this Plan. The District may adjust the programs identified in this Plan as warranted due to new technology or analysis of the effectiveness of individual programs.

8.5 Compliance with State Planning Requirements

Colorado Statutes Title 37 Water and Irrigation – Colorado Water Conservation Board (CWCB) and Compacts 37-60-126 requires a state approved water conservation plan for covered entities as a condition of seeking financial assistance from the CWCB. Because IWSD is not categorized as a covered entity, those provisions are not applicable to this Plan, although it is largely based on the key planning requirements of that statute.

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